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Microsoft HoloLens

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# BUILD 2015: A closer look at the Microsoft HoloLens hardware

By [Todd Holmdahl](https://blogs.windows.com/devices/author/toddholmdahl/)  
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## **This week, at the Microsoft Build Developer Conference, we showed some of the progress we have made since we first introduced Microsoft HoloLens to the world – less than 100 days ago.**

We demonstrated a number of exciting new scenarios, made possible through HoloLens powered by Windows 10. Among other things, we announced that for the very first time, we would provide an opportunity for thousands of developers at Build to experience our hardware.

So far, the feedback we have received has been pretty incredible and the possibilities that we asked people to imagine are coming to life. The era of holographic computing is here and today I'm honored to share more information about our HoloLens hardware and how it works to make holograms real.



BODY\_Build\_Hololens

**Transforming the world**

Our vision for holographic computing is to transform the world with holograms – seamlessly connecting the digital world with real life. With the ability to design and shape holograms, you will have a new medium to express your creativity, a more efficient way to teach and learn, and a more effective way to visualize your work and share ideas. This means your digital content and creations will be more relevant when they come to life in your world.

Holographic experiences are made possible across a world of devices through Windows 10, including HoloLens – the first fully untethered holographic computer running Windows 10, because holograms are Windows universal apps, and all Windows universal apps can be made to work as holograms.

While a variety of specialized components make up HoloLens, it's the way in which they are combined that makes the whole system seem like science fiction. Like the way the optical system works in lock-step with the advanced sensors, or the way the holographic processing unit makes light work of large amounts of data per second.

They all work together to enable holographic computing natively with no markers, no external cameras, no wires, no phone required, and no connection to a PC needed – doing a whole host of things that are in reality very difficult and technically complex – turning what was once science fiction into science fact. That untethered engaging experience is in-line with our vision to ensure that content comes first, allowing you to freely move within and around it.

### **Comfortable fit**

HoloLens is a true collaboration between industrial designers, human factors experts, and engineering teams, and is designed like a performance car with great weight distribution for the most comfortable fit possible.

The device weighs significantly less than the average laptop, while at the same time containing significantly more computing power. And, to accommodate a large number of customers, HoloLens is designed to adjust to fit a wide range of head

sizes and shapes while also accommodating most eyewear, without putting any undue pressure on your ears or nose.

HoloLens' see-through holographic high-definition lenses enable you to see holograms right in your world, right in your lives, with more reality than ever before. Employing an advanced optical projection system, the see-through lenses generate multi-dimensional full-color images with very low-latency so you can see holographic objects in the physical world.

Unlike typical VR systems, where the physical world is completely occluded, the see through lenses allow you to continue to see much of the world around you. This is because we want to allow you to be present in the real world. With HoloLens, the experience leads – content comes to life, holograms join your real world environment – and the device quickly fades to the background.

### **Spatial sound**

HoloLens has spatial sound so you can hear holograms even when they're behind you.

Using a scientific model that characterizes how the human ear receives sound from a specific physical location, HoloLens can synthesize a binaural sound so that you perceive it to come from a specific location in the physical space around you. There's also a microphone array which is used to capture your voice commands, a depth sensor that is used to spatially map your environment and interpret your hand gestures, and a photo/video camera so you can share what you're doing with others.

The advanced sensors in HoloLens capture information about what you're doing and the environment you're in. This is done through the inertial measurement unit (IMU) which includes an accelerometer, gyroscope, and magnetometer. It's this IMU, coupled with head tracking cameras, which enables HoloLens to understand where your head is and how it's moving.

### **Processing power**

In addition to the IMU, HoloLens comes with a CPU and GPU. But that wasn't enough to handle all the processing required to understand our world, so we had to go beyond the traditional CPU and GPU.

We invented a third processor: A Holographic Processing Unit (HPU). The HPU gives HoloLens the real-time ability to understand where you're looking, to understand your gestures, and to spatially map the world around you. Conceived, designed, and engineered by Microsoft, the HPU is designed specifically to support the needs of HoloLens.

This custom silicon efficiently processes data from the sensors, resulting in a relatively simple yet informative output that can be easily used by developers so they can focus on creating amazing experiences without having to work through complex physics calculations.

With HoloLens, Microsoft is focused on delivering powerful experiences – the best entertainment experiences and the highest levels of productivity to usher in a new era of computing experiences.

This is everything you need to step into the holographic landscape, transforming the world with holograms; all you need to create, consume, and share holographic experiences and to transform the world with holographic computing.

For more information on HoloLens, check out our website [www.HoloLens.com](http://www.HoloLens.com) (<http://www.hololens.com/>). And if you didn't have an opportunity to watch the Build keynote, a video recording is available at [www.buildwindows.com](http://www.buildwindows.com) (<http://www.buildwindows.com>).

*Todd Holmdahl leads Microsoft's next generation devices team.*

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